

**2<sup>nd</sup> ERA-NET CRUE Research Funding Initiative  
Flood resilient communities – managing the  
consequences of flooding  
Interim Report**

***Flood Incident Management – A FRAMEwork for  
improvement – FIM FRAME***

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## **1 Introduction**

This interim report has been produced as part of the ERA NET CRUE research project entitled Flood Incident Management – A FRAMEwork for improvement (FIM FRAME). The objectives of the research can be summarised as follows:

- To assess the “effectiveness” of a sample of flood emergency plans in the UK, The Netherlands and France
- To evaluate the current tools that are used to inform flood emergency plans and the ability of these tools to support future flood event emergency planning with the main aim of reducing residual risk
- To establish how currently available tools (e.g. guidelines, models) can be used to improve emergency management plans for floods and whether there are any gaps in the tools that are available
- To provide a framework by which flood incident management can be improved that will be tested in a number of case studies

The research has been carried out in six Work Packages (WPs) as follows:

- WP1 - Effectiveness and robustness of flood emergency plans
- WP2 - Comparison of currently available tools for the emergency planning of floods
- WP3 - Development of a framework to improve flood event management
- WP4 - Case studies utilising the developed framework to improve emergency plans working together with emergency responders, emergency planners and other stakeholders
- WP5 - Dissemination of the results
- WP6 - Management and coordination

In terms of this research the terms “resilience” and “community” have been interpreted in the following ways. Resilience has been interpreted as “the ability of a community to return, quickly and easily, to normal after it has been flooded” (adapted from De Bruijn & Klijn, 2001, De Bruijn, 2005). Community has been interpreted as “a social group of any size whose members reside in a specific locality and share the same governance

structure or other social characteristics”.

With reference to the FIM FRAME project the overarching aim is how emergency plans for floods can be improved to allow communities to survive and recover as rapidly as possible from the effects of floods. In the past structural mitigation measures have been put in place to reduce exposure and risk to flooding of communities. It is now widely acknowledged that flood risk cannot be completely eliminated through structural measures. The paradigm of attempting to reduce the flood risk as much as possible purely through structural measures has progressively been overtaken by a more holistic approach to flood risk management (Lagadec, 2002).

In the past decade, the emergency management of floods in Europe has placed increasing importance on developing enhanced and preparedness capacities. In this regard, the concept of emergency management has shifted from a primary focus on responding to the flood and its impacts to one of increased attention to communities to prepare and become more resilient to the impacts of floods. The capacity to respond effectively remains important, however, emergency responders and planners are looking more intently at the earlier stages of emergency planning and how plans can be improved.

## 2 Methods

### WP 1 – The effectiveness and robustness of emergency plans for floods

An emergency plan may be defined as a “coordinated set of protocols for managing an adverse event, whether expected or untoward in the future” (Alexander, 2005). Research carried out by Alexander has found that there is an “enormous variety and lack of homogeneity” amongst emergency planning documents in many parts of the world. Alexander postulates that this implies that there is “a shortage of adequate standards [or metrics] for creating, evaluating and approving emergency plans” (Alexander, 2002, 2003, 2005) and that “virtually no appropriate standards seem to exist” (Alexander, 2005). Alexander also found that there was little in the way of metrics via which the “fitness for purpose” of emergency management plans can be assessed.

As part of WP1 the following was carried out:

- Twenty-two metrics were developed to assess flood emergency plans. These fall into six categories as follow:
  1. Objectives, assumptions and target audience
  2. Organization and responsibility
  3. Communication
  4. Flood hazard
  5. Flood risk to receptors (e.g. people, buildings, critical infrastructure)
  6. Evacuation
- Thirty-eight flood emergency plans in England and Wales, France and the Netherlands were assessed using these metrics. The development of the metrics also allowed the plans to be “scored” in a quantitative manner
- An online survey was sent to stakeholders in England and Wales, France and the Netherlands. The questions focused on the requirements for information in the plan development stage, and its usefulness and required level of detail. In total 208 people responsible for formulating and contributing to emergency plans responded to the survey
- Face-to-face meetings and consultations were held with emergency planners and responders in England and Wales, France and the Netherlands with regards to the effectiveness of emergency plans for floods

## **WP 2 – Comparison of currently available tools for the emergency planning of floods**

Research was undertaken with flood managers in England and Wales, France and the Netherlands to gain an idea of the level of awareness that they had of the tools that have been developed and that could be potentially used to improve flood emergency plans. Stakeholders were engaged through two main methods:

- Face-to-face discussions
- An online survey that was disseminated to flood managers who contribute to emergency plans within the three countries

A review of tools that are available in the three countries and that are relevant to flood emergency planning was also undertaken. The tools reviewed fell into the following categories:

- Guidelines and checklists
- Flood hazard mapping tools
- Tools related to assessing the risk to people, vehicles, evacuations times and safe havens

## **WP3 - Development of framework to improve flood event management**

A framework, for preparing or enhancing a flood emergency management plan, has been developed. This framework has been designed to be:

- Simple, to be applied by anyone without specific training
- Transportable, to be applied independently anywhere and by any flood emergency management team
- Generic, to allow it to be adapted by the user for their specific purpose

The framework is structured in three steps:

1. Appraise – applying the metrics to 'flag up' general issues
2. Tackle - structuring\de-structuring the process and identifying specific issues
3. Implement - taking actions forward and updating the plan

The framework has been based on methods developed by Mayon-White and Dyer (1997). Figure 2.1 shows a diagram of the developed framework.

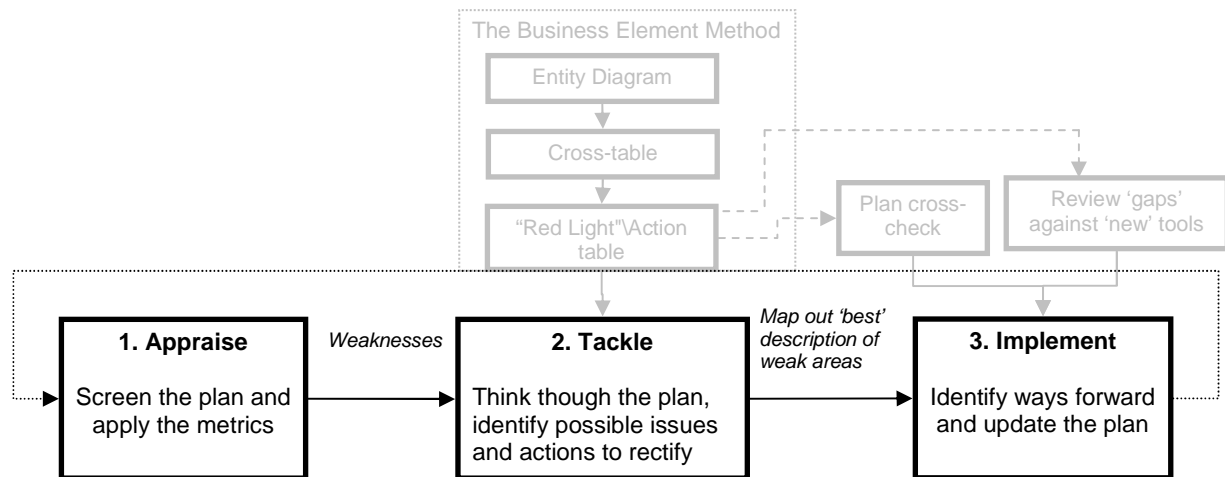
The three steps do not need to be applied sequentially and the framework can be used by starting from any of them. For example, if no plan is in place the framework can be applied starting from step 2. If some issues have already been identified e.g. as result of a post-emergency appraisal or an exercise, then the starting point could be step 3. The framework can also be used to re-appraise a plan after its last update.

Stage 2 ('Tackle') is based on an interpretation of how the 'Business Elements Method' could be applied for emergency planning (Mayon-White and Dyer, 1997). The Business Elements Method (BEM) is a tried and tested guide for analysing any process (or event); in this case the flood emergency plan. This method consists in examining the process in terms of five factors:

- Processes and procedures
- Roles and responsibilities
- Data and information

- Tools
- Audit

Considering these elements can help to produce a clearer picture of the process, and assist in gaining an understanding of the interdependencies between the different components. This can help to identify possible issues and provide a clear understanding of how to address these and how these can affect the process if they are not addressed.



**Figure 2.1 Diagram of the proposed framework**

The proposed framework was tested in a workshop held with emergency planners and responders in the England and Wales. The framework will be further tested in the Netherlands and France. In the Netherlands two workshops will be organised in the coming months in cooperation with two Safety Regions of which one is responsible for the city of Dordrecht. The city of Dordrecht has been designated as case study area in the Netherlands for the FIM FRAME project. In France several workshops have been planned in the Gard Region. The outcome of the workshops will aid in refining the framework. The Framework has been set up to be generally applicable. In addition it provides an opportunity for allowing the people responsible for event planning to become more familiar with applying it.

## WP4 Case studies

There are three cases studies being carried out as part of WP4. Three case studies have been selected for consideration within this work package, these are:

- Orb River basin, France
- The city of Dordrecht in the Netherlands
- The city of Sheffield in South Yorkshire in the UK

The framework produced as part of WP3 will be tested on the emergency plans for floods that have been produced for these areas. In each of the case study areas different types of floods were addressed as follows:

- Flash and fluvial floods in the Orb River basin, France
- Coastal floods in the Netherlands
- Surface water floods and dam breaks in the city of Sheffield, UK

### **Orb basin, France**

The Orb River basin is a 2500 km<sup>2</sup> coastal Mediterranean catchment near the city of Beziers in southern France. Over 20,000 people are prone to floods. Ten flood emergency plans (Plans Communaux de Sauvegarde (PCSs)) have been already set up in the Orb River basin but they only partially cover the requirements of the at-risk community and need to be improved.

As part of the FIM FRAME project three French researchers have been working in the catchment. They worked closely with local emergency planners and local communities regarding the PCSs in various communes. Work has been undertaken on:

- Perception and knowledge of the PCSs in two communes of Orb River basin
- The dissemination of PCSs in the Herault Département: A survey of mayors' attitudes to the legal requirements of PCSs
- What flood risk information is relevant for emergency managers for the production of PCSs in the Gard Département

The results of this research has been published and disseminated in French to the relevant stakeholders in the case study area.

### **The city of Dordrecht in the Netherlands**

The city of Dordrecht has a population of around 120,000. The city is located on an island which is threatened by floods from the tidal reaches of the Rivers Meuse and Rhine. Part of the city is situated in flood prone areas, not protected by dikes. The regional police and fire departments are involved in the so-called "veiligheidsregio (Safety Region) Zuid-Holland zuid". In this area the prediction times for floods can be very short. A flood will cause the island to fill up rapidly with water, because the inner dike area is below river level and large water depths are possible. Preparing for an evacuation is an important issue for this area. The emergency plan assumes a total evacuation of the island. Experts and emergency planners expect this to be an impossible task, owing to the number of people and time it would take to evacuate them.

In the case study the contribution of different evacuation options and strategies, e.g. the current strategy versus options to evacuate to safe havens within the area is being investigated. Use of new enabling technologies (e.g. dynamic evacuation and loss of life models) identified in WP2 will be applied to evaluate the effectiveness of the different strategies. The research will be carried out in cooperation with the responsible Safety Region. We will investigate how the new enabling technologies and the resulting information on evacuation possibilities would improve the response to floods and reduce the residual risk.

### **The city of Sheffield in the England**

Sheffield is a major industrial city in the north of England that is characterised by many hills and narrow river valleys. There are a number of large dams located upstream of Sheffield many of which are over 150 years old. The city suffered badly from pluvial flooding in July 2007, which caused widespread disruption. In the nineteenth century some 300 people were killed as the result of a dam break upstream of Sheffield. As part of the research the team has been liaising with the South Yorkshire Fire and Rescue service, which forms part of the Local Resilience Forum; who are responsible for producing the emergency plan. As part of the case study application, models are being applied to simulate the impacts resulting from a dam failure, and how the resulting flood wave impacts the downstream population in terms of loss of life. These models will help to demonstrate the use of enabling technology as part of the research. The research may also consider the impacts from a high rainfall event, such as that in July 2007.

## WP5 Dissemination of the results

This is covered in the section below.

## WP6 Management and coordination

The project is coordinated and managed by HR Wallingford. In order to ensure good communication between the partners, regular telephone conferences have been held, as well as various face-to-face meetings between the project partners.

# 3 Results and discussion

## WP 1 – The effectiveness and robustness of emergency plans for floods

The review of the emergency plans found that there was often a lack of homogeneity between the emergency plans. Many of the plans reviewed had what could be classed as a large amount of generic “cut and paste” text on flooding but had limited text on local or regionally specific issues. It appears from the research that many of the responders would like more specific information especially with regards to the nature of the flood hazard and the accessibility of roads to emergency services and other vehicles for different flooding scenarios. In many densely populated areas it would be relatively easy to develop such maps for different probabilities of flood events.

Metrics related to organisational aspects of the plan such as: plan activation; roles and responsibilities; communication with other agencies; and target audience and updating scored well in all three countries. However, the assumptions made by the plans did not appear to be well defined. Details of previous floods although covered reasonably well in England and Wales, and France were not covered well in the Netherlands; this probably as a result of the fact there have been no major flood events in the Netherlands since 1953.

Metrics related to the possible impacts of floods on receptors such as businesses; critical infrastructure; people; vulnerable people and NaTechs (Natural Hazard Triggering a Technological Disasters) all scored well below average in all three countries, as well as the metrics concerned with evacuation aspects. The metric covering the relationship between complementary plans in England and Wales scored “above average”; however, in France and the Netherlands this metric scored “below average” indicating that there may be a “disconnect” between different complementary plans and that if other plans are referenced there is often not a detailed or clear link provided to them.

As part of the online survey carried out the responders were asked to briefly list up to five criteria that they believed make a flood emergency management plan effective. The various responses for each country were grouped under generic headings. The top five generic responses are given in Table 3.1. In all three countries stakeholders indicated that for plans to be effective the roles and responsibilities should be clearly defined. One responder summed up that an effective flood emergency plan needed to have “*Roles and responsibilities clearly spelt out and agreed (with no assumptions made by any organisation)*”.

The role of “trigger levels” also featured in many responses in all three countries. A trigger level can be defined as “an action causing the automatic invocation of a procedure”. Many responders stated that for a plan to be effective clear triggers are needed to invoke actions and responses. Clarity, adaptability, accessibility and brevity of the plan were also mentioned by many responders as being important; however, the

research found that the ease of navigation of a plan may actually play a more important part in its accessibility than its length.

Information on the flood hazard was also seen as important. Responders stated that they would like to see the inclusion in plans of larger maps or maps showing more detail; maps highlighting “hotspots” and the inclusion of the flood maps on integrated GIS systems. Details of flood depths and velocities were also seen as important, as well as having a number of different flood scenarios.

**Table 3.1 Criteria perceived by stakeholders to make a flood emergency plan effective**

Rank	England and Wales	France	The Netherlands
1	Roles and responsibilities	Roles and responsibilities	Roles and responsibilities
2	Trigger levels	Trigger levels	Information on the flood hazard and related information
3	Information on the flood hazard	Information on the flood hazard	Clarity and accessibility of plans
4	Clarity and brevity of the plan	Adaptability and simplicity	Training in the use of the plan
5	Relationship with other plans	Training in the use of the plan	Trigger levels

The research found that there was a discrepancy between the level of details required by emergency planners and the actual level of detail that is available within emergency plans for a number of issues. This discrepancy is less critical for the metrics related to communication and organisation. It can therefore be concluded that the emergency plans do not comply with the requirements on issues related to receptors such as critical infrastructure, people and buildings.

A detailed report has been produced as part of WP1 describing the work that has been carried out. This has been appended as an Annex A to this interim report.

## **WP 2 – Comparison of currently available tools for the emergency planning of floods**

A brief review of tools that are available in the three countries was carried out. The tools reviewed fall into the following categories:

- Guidelines and checklists
- Flood hazard mapping tools
- Tools related to assessing the risk to people, vehicles, evacuations times and safe havens

Research was undertaken with flood managers to gain an idea of the level of awareness that they had of the tools that have been developed and that could be potentially used to improve flood emergency plans. Stakeholders were engaged through two main methods:

- Face-to-face discussions and meetings
- An online survey in English, Dutch and French that was disseminated to flood managers within the three partner countries

For each of the countries the flood managers were asked about the tools, methods and guidelines that they currently use or knew of that could be of assistance in formulating emergency plans for floods.

The research also investigated what tools are actually being used by flood managers to help them inform emergency plans, and also the reasons why tools were not being used. Finally flood managers were asked to provide comments on tools, methods or guidance that could usefully contribute to improving emergency plans for floods. In England and Wales there was 53 Environment Agency staff who responded to the survey of which 39 completed all the questions. In France 77 flood managers commenced the survey with 31 people completing all the questions. It is important to note that in the Netherlands the response rate to the survey was low. There were eight responses of which five people worked for a Dutch research institute who produce tools for flood risk management.

From the research carried out many flood managers are often not aware of the tools that are available to assist them in providing information to emergency plans for floods. Based on the online survey of flood managers in the three countries, the two main obstacles to tools not being used appear to be:

1. Lack of awareness of the methods that are available
2. Availability of data

In formulating emergency plans for floods it would appear that “expert judgement” is often used rather than specific tools. Many responders to the survey mentioned that they used a combination of information rather than specific methods or tools. For example in the survey in England and Wales around half to a third of the responders stated that they were aware of or used the following methods to inform Multi-Agency Flood Plans (MAFPs):

- Accessibility of inundated roads
- Optimisation of the location of shelters
- Damage to critical infrastructure
- Optimal evacuation routes
- Effects of improvements in flood warning on the risk to people
- Methods to assess potential injuries and loss of life

However, none of the 44 responders who are involved in providing information to assist with the formulation of MAFPs explicitly mentioned any methods or tools that provide such information.

In France the awareness level of the tools and methods available would appear to be lower than that in England and Wales and the Netherlands. The lack of awareness in general may be as a result of a need to improve the dissemination of the tools and the relevant research. The lack of awareness of tools to assess the consequences of flooding or to assess potential damage has already been pointed out in many articles and reports in France (Hubert & Ledoux, 1999).

In all three countries there would appear to be a requirement for some form of guidance on what tools are available, what data they require and how they can be implemented to give information that can be used to improve emergency plans for floods.

Another detailed report has been produced as part of WP2 describing the work that has been carried out. This has been appended as an Annex B to this interim report.

## **WP 3 – Development of framework to improve flood event management**

A workshop was held in England and Wales with emergency planners in July 2010 to:

- Present the draft framework
- Gather feedback on the framework and possible ways forward
- Provide the basis for discussion on emergency planning issues that might lead to potential actions to tackle some of the identified issues and how they could be addressed within the framework

The stakeholders at the workshop provided feedback on the next steps of the project and relative timescales. These will include:

- Reviewing the framework and running a second workshop by the end of October 2010
- Running a workshop to discuss the application of the framework in the case studies by the end of February 2011
- Updating the framework and running national events for sharing the experience of those who participated to the project, as well as gaining a broader feedback on the framework before the end of June 2011

Preparations are being made for similar workshops in France and the Netherlands to be held around October 2010.

## **WP 4 – Case studies**

In terms of the case studies the following has been carried out:

- Data has been collected in all three case study areas
- Work has been carried out setting up initial tools in the case study areas that can be used to help assist with and improve emergency management plans. These include a Life Safety Model that can be used to assess evacuation times and the potential loss of life for various flood emergencies
- Numerous meetings have been held with stakeholders in the case study areas produced that have provided direction to the outputs
- Three reports have been produced for stakeholders in the south-west of France these are on the subjects of: Perception and knowledge of PSCs for two communes in the Orb River basin; the dissemination of PCSs in the Hérault Département - a survey of mayors' attitude to the legal requirements of PCSs; A study on which information is relevant for emergency managers to produce PCS plans in the Gard Département

## **WP 5 – Dissemination of the results**

This is covered in the section below.

## **WP 6 – Management and coordination**

The project is coordinated and managed by HR Wallingford. In order to ensure good communication between the partners, regular telephone conferences have been held, as well as various face-to-face meetings between the project partners.

## 4 Dissemination

The dissemination activities that have taken place to date are detailed in Table 4.1.

**Table 4.1 Dissemination of the research**

Date	Place	Description
September 2009 to date	Sheffield, England	Ongoing dialogue and dissemination with stakeholders in the Sheffield case study area
September 2009	Wallingford, England	Meeting with Environment Agency flood incident staff to discuss the metrics and outputs of project
October 2009	Rome, Italy	Presentation of FIM Frame project at the ERA NET CRUE Rome meeting
October 2009	Not applicable	Project web site <a href="http://www.fimframe.net">www.fimframe.net</a> set up
November 2009	Ipswich, England	Meeting with emergency planners
November 2009 to January 2010	Throughout France	Face to face meetings held with emergency planners to discuss the metrics and the output of the project
November 2009	Throughout the Netherlands	Various face to face meetings with emergency planners held by the project team
December 2009	Paris, France	Meeting held with project partners to disseminate the objectives, direction and outputs of the project
December 2009	Wallingford, England	Meeting with Environment Agency flood incident staff to discuss outputs of project
December 2009	Sheffield, England	Meeting held with stakeholders in Sheffield case study area to discuss the project and disseminate the objectives
January 2010	Throughout the Netherlands	On line survey in Dutch sent to emergency managers
January 2010	Throughout France	On line survey in French sent to emergency planners
January 2010	Throughout the Netherlands	On line survey in Dutch sent to emergency planners
January 2010	Throughout England and Wales	On line survey in English sent to flood managers
January 2010	Throughout France	On line survey in French sent to flood managers
January 2010	Throughout the Netherlands	On line survey in Dutch sent to flood managers
February	Reading, England	Meeting held with Environment Agency staff to disseminate the objectives of the research and the development of the metrics
March 2010	Birmingham, England	Meeting held with UK Project Board to review project progress, particularly the WP1 and WP2 draft reports
May 2010	Not applicable	Production of report detailing WP1 work disseminated to relevant stakeholders

**Table 4.1 Dissemination of the research - continued**

Date	Place	Description
May 2010	Not applicable	Production of report detailing WP2 work disseminated to relevant stakeholders
May 2010	Roche Sur Yon, France	One day meeting with emergency services to discuss the use of enabling technologies and tools in the production of emergency plans for floods
June 2010	Not applicable	Production of note on proposed framework disseminated to relevant end users
June to September 2010	Gard Département, France	Various meetings with emergency managers for the production of PCSs. Report produced and disseminated in France
June to September 2010	Herault Département, France	Meetings with various mayors responsible for emergency planning. Report produced and disseminated in France
June to September 2010	Orb River basin, France	Various meetings with emergency managers for the production of PCSs. Report produced and disseminated in France
June 2010	Throughout France	Short ten page briefing note produced in French to disseminate the results of WP1 and WP2 to French stakeholders
June 2010	Sheffield, England and Wales	Meeting held with the fire service and emergency planners to discuss enabling technologies that could be used in the case study
July 2010	Ipswich, England and Wales	Workshop for testing proposed framework
July 2010	Roche Sur Yon, France	Meeting with emergency planners
July 2010	Not applicable	Paper entitled "An assessment of flood emergency plans in England and Wales, France and the Netherlands" submitted to the Journal of Natural Hazards
August 2010	Not applicable	Draft paper produced entitled "Tools to improve the production of emergency plans for floods – are they being used by the people that need them?" This paper will be submitted for publication in the Journal of Emergency Management
August 2010	Not applicable	Paper entitled "Agent-based modelling to inform flood emergency planning and management" accepted for publication in the Journal of Emergency Management

## 5 Contributions to the overarching questions

This section addresses the contributions to the overarching questions. These are detailed in the section below.

### **How does your project contribute to the implementation of a) preliminary flood risk assessment, b) flood hazard maps and flood risk maps and c) flood risk management plans?**

In terms of the implementation of the preliminary flood risk assessment and the flood hazard and flood risk maps these are not applicable to this research. However, the research will contribute to the implementation of flood risk management plans. Flood risk management plans should focus on prevention, protection and preparedness (EC, 2007) this encompasses emergency plans and planning, particularly the impacts on receptors.

The results of the research undertaken to date including the online surveys give a good overview of the aspects of emergency planning that need to be improved within each of the three countries. The research has shown that often tools (e.g. software, guidelines and methods) that are available which can produce useful information to improve emergency plans are often not currently being used by emergency planners. The metrics produced by the research provides emergency planners with a simple and flexible instrument for evaluating and improving their emergency plans across Europe.

The framework brings the different tools developed within the FIM Frame project together and provides an easy to use method for evaluating and improving the emergency plans and process. These outputs will help to improve flood risk management plans.

### **How did you account for interests of all potentially affected parties, i.e. general public, trans-boundary parties, policy maker etc. and how did that impact your results?**

From the start of the project, close contact has been kept with the affected parties. This has been done through the face-to-face interviews, through the internet surveys asking the affected parties for their input, opinion and experiences and through a number of workshops. This has resulted in a high level of participation in the research. The research has been carried out in close cooperation with the Environment Agency, the Dutch National Water Board and emergency planners in England and Wales, France and the Netherlands. The contact with the affected parties has impacted the development of the surveys used in the research and the development of the framework so that it is compatible for the needs of emergency planners.

### **How does your project contribute to a) strengthen public participation in the establishment of future flood risk management plans, b) valuable lessons for public authorities/institutions and c) good governance?**

In all three countries the general public are currently not directly involved in the creation of emergency plans for floods. However, the framework that has been developed as part of the research could help to facilitate the process of engaging the public in the future. The project has and will contribute valuable lessons to public authorities/institutions. For example, the research has shown that at present emergency plans for floods tend to be

inconsistent and are not always “fit for purpose”. The framework produced as part of the research will help to bring together the stakeholders responsible for producing emergency plans such as the Environment Agency in England and Wales, Water Boards in the Netherlands and local authorities in France. The research has also shown that enabling technologies, such as tools, the results of which can help to improve the content of emergency plans are generally not being used by flood managers and emergency planners. The case studies and guidance that are being produced as part of this research will help to improve this situation.

The principles of good governance suggest that this must be: coherent (with good communications between all parties); proportional; open (with access to information); effective; participatory and engaging. Recent flooding in Europe has highlighted that currently local responses to flood events are often too reactive and may not meet the needs of communities. Proactive action is necessary to support communities. The research has produced metrics that allow authorities to assess the strengths and weaknesses of their emergency plans. The framework provides a generic method for improving and formulating emergency plans for floods. The framework should contribute to good governance in the countries where it is being developed as many of the people responsible for the implementation of emergency plans in all three countries are elected officials.

The project will also help to contribute to good governance by helping to ensure that all the relevant stakeholders can be heard and have fair access to the decision making processes when emergency plans for floods are drawn up. The framework should enable relevant stakeholders to understand how the plan has been produced and how it can be improved.

### **What insights will your case studies provide to balance the drive for consistent, (trans-boundary) national flood risk management strategies and the need for local tailor-made solutions?**

Although it is seen from the case studies that a wide range of flood situations occur across Europe, the way emergency planning is tackled, shows many similarities. The generic framework has been developed to support the emergency planning in a uniform manner. The survey results show that there is a concern amongst emergency planners about the lack of consistency and the gap between national and local scale emergency plans. The framework that is being produced is generic and it can be used for both national and local emergency planning, and allow site-specific parts of flood plans to be considered in more detail, whilst remaining within the bounds of the overall plan.

### **To what extent is the generalisation of the results restricted by context variables in the case study area, such as: a) social/socio-cultural-historical/legal-institutional/political/economic characteristics, b) the flood type and degree of awareness and c) uncertainties and the way they are dealt with?**

In selecting the case studies, the project team sought to choose different types of flood hazards (e.g. fluvial, coastal, surface water and dam break floods) as well as different flood risks (e.g. people, properties). This will allow the outputs from the research to be tested against as many different flooding combinations as possible. Although there will always be an issue of the case study results not being generally applicable, the work packages do seek to draw general conclusions, based around the national flood plans in the three countries. The developed framework is designed to be generic and cut across the national differences and will provide a consistent appraisal methodology and guidance.

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